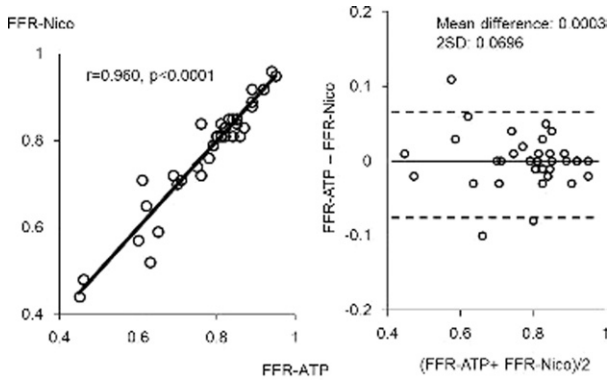

Conclusions: This study suggests that intracoronary nicorandil administration might be safely and feasible compared to intravenous ATP infusion for FFR measurements.

TCT-230

Instantaneous wave-Free Ratio (iFR) and Gradient (iFG): new promising adenosine-independent alternative to fractional flow reserve. Preliminary results from the FORECAST Study

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Background: The assessment of non-culprit stenoses is an important issue in ACS. Adenosine administration is currently required for functional evaluation of stenosis severity using the fractional flow reserve (FFR). An alternative adenosine-independent index of coronary stenosis, the instantaneous wave-free ratio (iFR), was recently introduced. Aim of the present study was to evaluate the trans-stenotic instantaneous wave-free pressure gradient (iFG), the instantaneous wave-free ratio (iFR) and the fractional flow reserve (FFR) in ACS patients.
Methods: Intracoronary diastolic pressure was measured proximal and distal to the stenosis during the wave-free period with a pressure wire (Certus, St. Jude, USA) at baseline and upon iv adenosine administration (140 ug/kg/min). The data were acquired with a PowerLab (AD Instruments, USA) and analyzed with a LabChart 7.
Results: A total of 71 stenoses were evaluated in the present study. iFR showed a correlation with FFR ($r=0.61$, $p<0.001$), while a proportional error was documented with the Bland-Altman analysis. At multivariate analysis, the localization of the evaluated stenosis within the coronary tree influenced the correlation of iFR with FFR ($p=0.03$). ROC analysis showed a promising diagnostic efficiency for detection of significant coronary stenosis with iFR (AUC=0.936; $p<0.001$) or iFG (AUC=0.944; $p<0.001$). Interestingly, iFR showed a sensitivity of 88.2% and a specificity of 75.9%, when the diagnostic threshold was set at 0.93. Similarly, iFG showed a sensitivity of 94.1% and a specificity of 79.6%, when the diagnostic threshold was set at 5.55 mmHg.
Conclusions: The instant wave-free ratio (iFR) and the resting distal-to-proximal pressure gradient measured during the wave-free period (iFG) showed a good diagnostic performance for the assessment of non-culprit lesions in ACS, representing a promising and adenosine-independent alternative to standard fractional flow reserve (FFR).

TCT-231

Investigation of Fractional Flow Reserve Correlation with Direct Anatomical Parameters Using a Percutaneous Model of Coronary Artery Stenosis

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Background: Vessel Minimum Lumen Area (MLA) is generally considered a critical parameter for PCI guidance. Recently the relevance of anatomical based criteria has been questioned as their correlation with functional measures such as pressure based Fractional Flow Reserve (FFR) remains modest. In patients, analyzing such correlation can be however challenging as not only lesion severity but general atheroma burden and diseased myocardium can also alter physiological response. We developed here a porcine-percutaneous model of coronary stenosis to delineate the interaction of different anatomical parameters on FFR.
Methods: We developed a series of percutaneous stenotic stent models, mimicking intermediate to severe stenosis, and implanted them in coronary arteries of 8 healthy hybrid landrace pigs. Optical Coherence Tomography (OCT) pullbacks and Fractional Flow Reserve (FFR) were acquired along the artery after implantation of the stenotic stent.
Results: Average MLA after deployment of the stenosis implant was 1.7 ± 0.5 mm2 ranging from 1.0 to 2.7 mm2 (95% C.I.: 1.3-1.9). Area stenosis ranged from 69.1% up to 84.0 % with an average area stenosis of 78.4 ± 5.8 %. Average FFR value was 0.83 ± 0.13. A poor correlation was observed between FFR and MLA or percentage area stenosis evaluated by OCT (respectively $r = 0.02$, $p = 0.94$ and $r = -0.55$, $p = 0.12$). On the other hand, a severity OCT evaluation based on a volumetric percentage stenosis taking into account not only the MLA, but also the length of the lesion, resulted in significant better correlation with FFR ($r = -0.78$, $p = 0.01$).
Conclusions: We present in this study a controlled in-vivo model to evaluate the impact of focal stenoses on physiological assessment. Initial results using this model suggest that a lesion assessment based on parameters taking into account both length and area severity may provide a better anatomical parameter than simple MLA or percentage area stenosis for assessment of lesion severity by intravascular imaging.

TCT-232

Left Ventricular Filling Pressures Affect Measurements of Fractional Flow Reserve

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Background: Fractional flow reserve (FFR), the hyperemic ratio of distal (Pd) to proximal (Pa) coronary pressure, is used to identify the need for coronary revascularization. Changes in left ventricular end-diastolic pressure (LVEDP) might affect measurements of FFR. The effect of changing LVEDP on FFR measurement is unknown.
Methods: LVEDP was recorded simultaneously with Pd and Pa during conventional measurement of FFR and during an additional, intravenous infusion of nitroprusside. The relationship between LVEDP and FFR was assessed using linear mixed models with a random intercept.
Results: Prospectively collected data for 528 cardiac cycles from 20 coronary arteries in 17 patients were analyzed. Mean Pa, Pd, FFR, and LVEDP were 73 mmHg, 51 mmHg, 0.71, and 18 mmHg, respectively. FFR<0.80 was present in 14 arteries (70%). With nitroprusside mean Pa, Pd, FFR, and LVEDP were 62 mmHg, 43 mmHg, 0.70, and 13 mmHg, respectively. In a multivariable model for the entire population LVEDP was positively associated with FFR such that for every 1-mmHg increase in LVEDP the measured FFR increased by 0.003 (beta=0.003, $p<0.001$). The association between LVEDP and FFR was more pronounced in obstructed arteries with FFR<0.80 (beta=0.005; $p<0.001$) and was absent in non-obstructed arteries with FFR>0.80 (beta=0.000, $p=0.841$).
Conclusions: In this population of coronary arteries with mean FFR = 0.71, LVEDP was positively associated with FFR. The association of LVEDP with FFR was more pronounced in obstructive disease. These findings may have implications for the use of FFR in patients with heart failure and coronary artery disease.

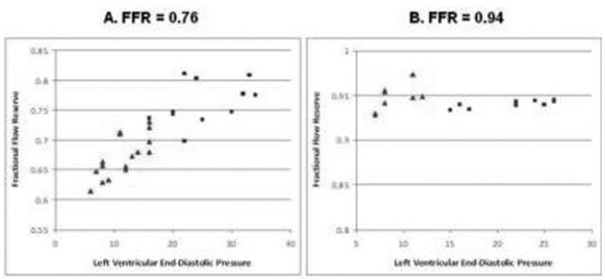

Figure 1. Beat-to-beat Association of Left Ventricular End-diastolic Pressure with Fractional Flow Reserve (FFR) in Representative Arteries with Obstructive vs. Non-Obstructive Disease. Data in panel A are from an artery with FFR = 0.76, while data in panel B are from an artery with FFR = 0.94. Blue squares indicate data obtained during conventional FFR measurement. Red triangles indicate data obtained during additional, intravenous infusion of nitroprusside.

TCT-233

Abstract Withdrawn

TCT-234

Prediction of fractional flow reserve using contrast media flow data under vasodilatation and the parameters of 3D coronary angiography

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Background: The fractional flow reserve (FFR) shows the reduction of the maximal achievable flow through the stenosis of a coronary artery. Its value is determined by the

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